

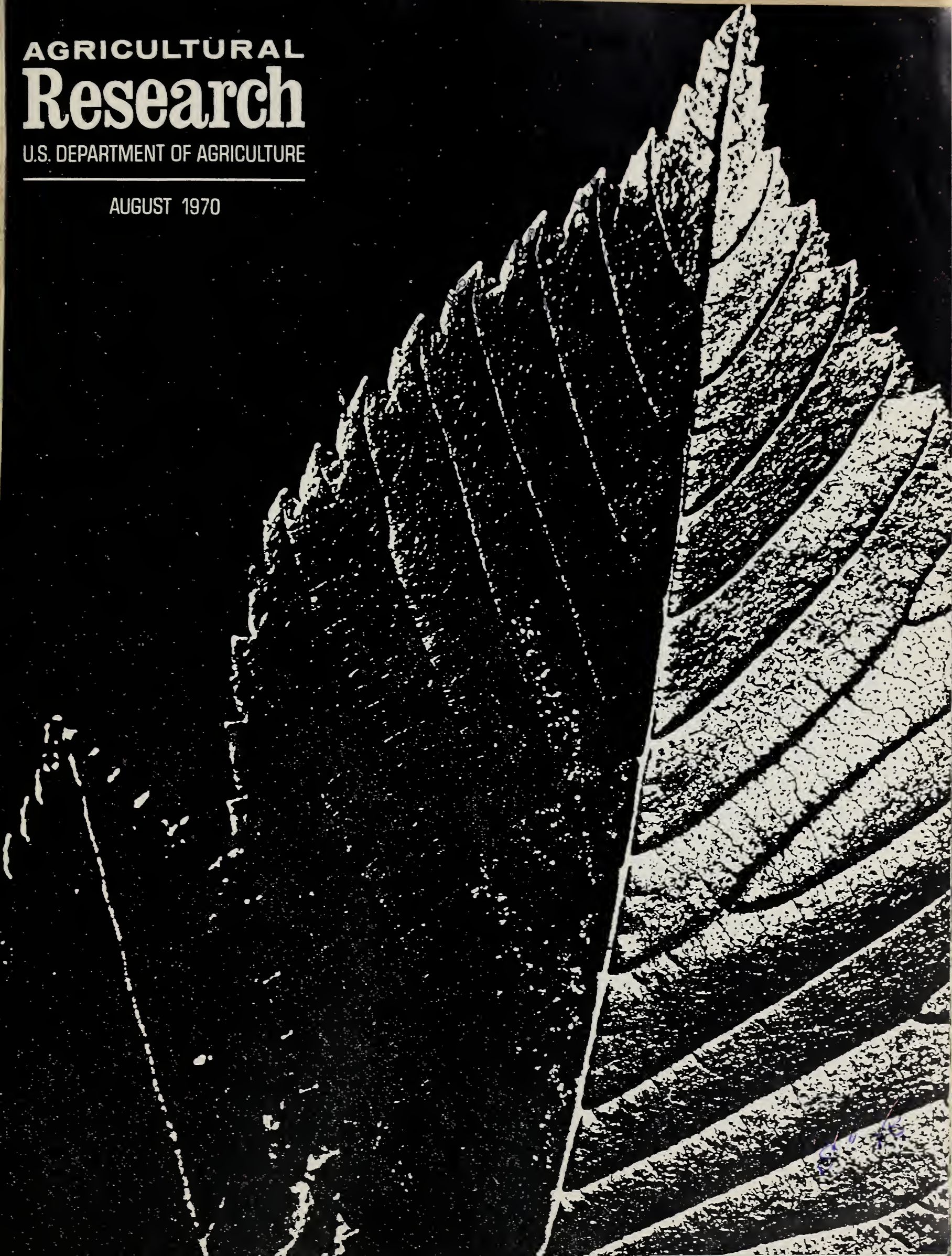
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AGRICULTURAL
Research

U.S. DEPARTMENT OF AGRICULTURE

AUGUST 1970



Soil and Health

Living organisms have been likened to fleshy envelopes made of air and water and enclosing a sprinkling of minerals derived from the soil. Some of these minerals—the trace elements—occur in exceedingly small amounts, but if they are lacking, plants and animals may develop hidden hungers that no amount of feeding will remedy and, beyond that, may lead to deficiency diseases.

Since soils are basic to life they are of special concern to many ARS scientists and colleagues of several disciplines who study trace elements and their nutritional effects as they move from the soil through the food chain.

Scientists encounter diverse nutrition problems as they explore the complex route followed by trace elements. Sometimes too little or too much of an element may be involved, but the amount of any one trace element that moves in the food chain is not a reflection of the total amount of that element in the soil. It is evident that some elements occur in the soil but are chemically locked up and not available to the plant. Scientists have also learned that the deficiency or toxicity of certain elements may be conditioned by the presence of other elements, nutrients, or organic influences in the environment.

Once scientists have determined how a trace element problem affects plants, animals, or people they work on ways to cope with it. Elements deficient in the soil may be added as a soil treatment, as sprays on feed or food crops, or administered as a treatment to livestock. If too much of an element is present in the soil, management practices must be devised to reduce the amount in crops. In the case of more stubborn elements—including those required by human patients—it may be necessary to provide supplements.

Although the intensity of cropping increases amid reports of nutrient deficiencies in soils and plants, the health of our agriculture and people continues to hold its own. In part, modern transportation has made the world our breadbasket so that feed and food from a deficient soil is balanced by the abundance of another. But our main line of defense rests on the constant gains achieved by the scientists who study the soil elements that maintain life.

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Clifford M. Hardin, Secretary
U.S. Department of Agriculture

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Agricultural Research Service

Taming the Mosquito



Technician Boston pours water on sterile pupae to keep them moist until they emerge as adults in protective shelter (570A 331-8).

BY TRYING SOMETHING NEW and something old in pest control methods scientists virtually eradicated the southern house mosquito in an offshore test area.

Sterilization, the new approach, combined with the old, sanitation measures for stagnant water in which the mosquito breeds, proved more effective than conventional insecticides while eliminating residue problems.

In the sterilization phase of the tests, ARS entomologists at Gainesville, Fla., treated mosquito pupae with thiotepa, a chemosterilant; emerging sterile males were then released on Seahorse Key, an island off the Gulf Coast of Florida. Thiotepa, like other chemosterilants, acts on insects by breaking their chromosomes. The resulting mutations prove lethal by preventing multiplication of cells in the embryo. The scientists released 13,300 of the sterilized males daily on Seahorse Key over a 10-week period.

Meanwhile, egg traps designed primarily as a survey tool also provided a sanitation measure. Surveys of female mosquitoes irradiated for tracing purposes showed that half their eggs were deposited in the stagnant water of the traps. These were periodically removed for laboratory analysis, a step which destroyed 50 percent of the pests'

eggs. Although elimination of mosquito breeding sites has long been regarded as an important sanitation control measure against the pests, this study shows the benefits of destroying

the eggs even without destroying breeding sites.

Before running these tests, ARS entomologist Richard S. Patterson and his associates stationed at Gainesville, Fla., developed mathematical models of sterilization's effects on mosquito populations. These were supported by concurrent field studies of changes in the insects' reproductive ability and survival rates over several generations.

Dr. Patterson, and ARS entomologists Donald E. Weidhaas and Clifford S. Lofgren and technicians Marcus D. Boston and H. Randy Ford found that the female southern house mosquito lays an average of one batch of about 180 eggs. Thus a single pair of mosquitoes could theoretically multiply ninetyfold.

However, at the beginning of the test, natural mortality held the reproduction down to 1.5 fold—only three offspring of each pair of mosquitoes survived. Mosquitoes became fewer after the first two generations of sterile male releases, but their rate of

reproductive success increased, resulting in fivefold and ultimately tenfold reproduction by the remaining unsterilized males on the island. Nevertheless, the population steadily declined with additional releases and the pests were nearly annihilated.

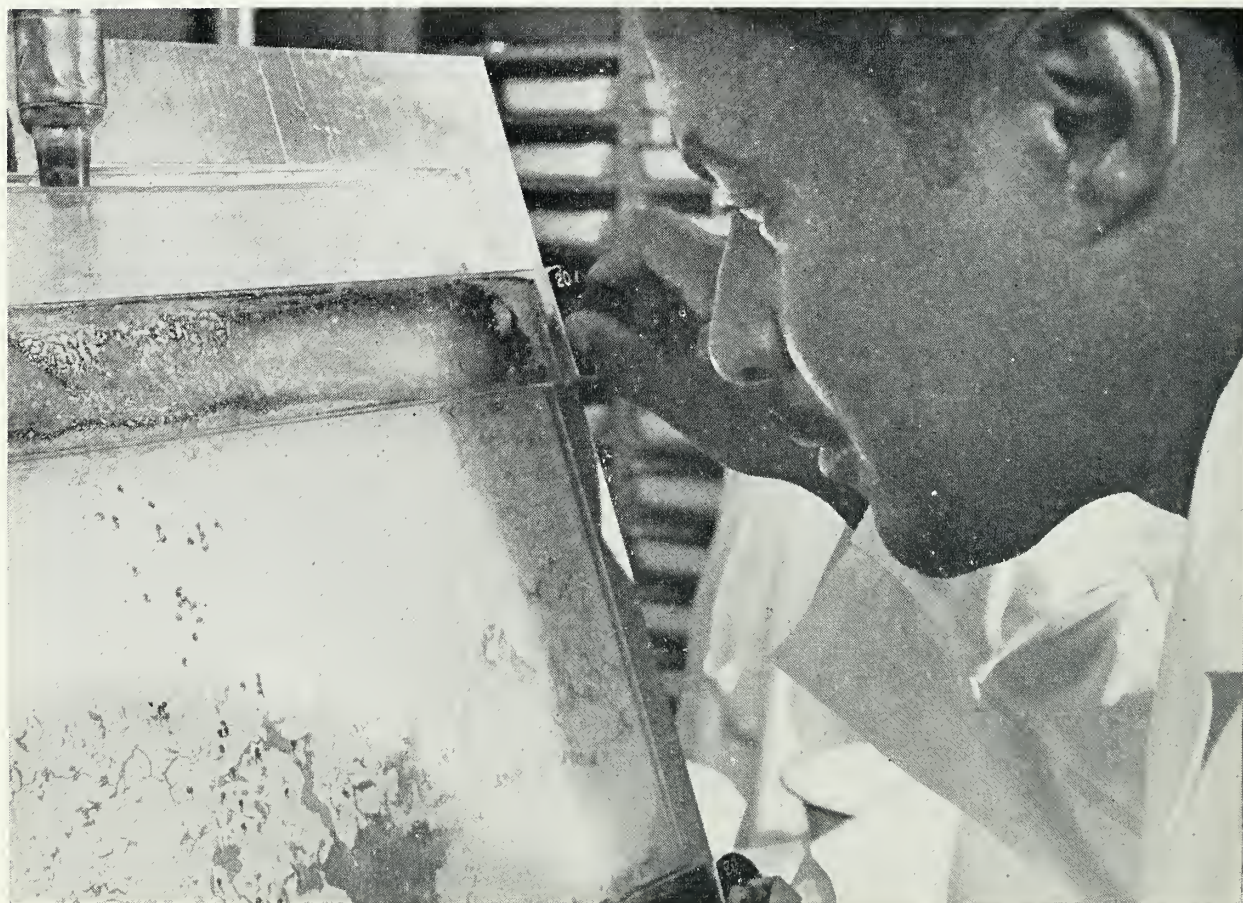
The increasing survival rate near the end of the pilot test may be accounted for partly by reduced competition among the insects for food and breeding sites. Another contributing factor was probably the reduction in pressure against the surviving mosquitoes by parasites, diseases and other natural control agents that may flourish when mosquitoes are abundant (AGR. RES., Sept. 1968, p. 10).

Eventual practical application of this principle should not alarm residents of release areas because the released males do not bite. Southern house mosquitoes represent a nuisance rather than a disease threat in the United States. In other parts of the world, however, they transmit a worm which causes elephantiasis. ■



Top: At one of the egg traps on the island, Mr. Boston and Dr. Weidhaas collect and count mosquito eggs (570A331-2).

Bottom: Mr. Boston sexes mosquito pupae in V-shaped device made by locking two glass panels. Males, being smaller, can pass through the opening while larger females are wedged in the middle (570A360-22).



Nutrients influence VITAMIN A METABOLISM

UNDER WHAT DIETARY CONDITIONS is vitamin A in adequate supply?

Nutrition studies in the United States and abroad indicate that vitamin A may be one of the essential nutrients frequently in short supply in current diets. Deficiencies can cause night blindness, epidermal lesions, and, in extreme cases, paralysis and nerve degeneration. Tests with rats have proved that vitamin A, or retinol, is as essential as vitamin E for reproduction and lactation.

Vitamin A, for the metabolic needs of the human body, can come from two sources. One source, retinol, which is derived from animal products, is stored in the liver and from the liver is distributed as a protein complex to various organs.

Secondly, vitamin A may be formed from provitamins called carotenoids, which are derived from vegetable sources, such as carrots, other yellow vegetables, and some green vegetables. Their exact metabolic pathways are not known. The most active carotenoid is beta-carotene.

Under a Public Law 480 grant from ARS, Polish scientists studied how dietary conditions affect vitamin A utilization. They found that utilization of vitamin A, especially when supplied by beta-carotene, may be significantly

influenced by *other dietary ingredients* in accompanying foods that serve as sources of vitamin A.

Using young rats as test animals, the Polish scientists studied the dietary influence of protein, fats, and carbohydrates on vitamin A and carotene utilization.

As a standard of measurement for beta-carotene utilization, the Polish scientists investigated the degree of carotene absorption in the intestinal tract and the storage of vitamin A in the liver. Utilization of vitamin A was measured only on the basis of liver storage.

The protein studies indicated higher utilization of administered beta-carotene in rats fed diets containing whole egg in comparison to either casein or gluten as the source of protein.

When different vegetable oils and hydrogenated fats were fed, no differences in utilization of beta-carotene as vitamin A were observed, regardless of fat source. For example, soybean oil showed no distinct influence on absorption of carotene concentrate as compared to other oils.

However, soybean oil did influence absorption and conversion of the vitamin in the liver when raw carrots were the source of beta-carotene. Therefore, some dietary fat appears to be essen-

tial for maximum utilization of carotene.

On a fat free diet, only one-third of the absorbed carotene from raw carrots was recovered as vitamin A in the liver; recovery was generally complete in diets containing 1, 8, or 19 percent soybean oil. These percentages are based on 1 gram per 100 grams of diet. For comparison to human dietary levels, 1 percent would represent a low fat level, 8 percent an intermediate level, and 19 percent a high level.

Carbohydrate studies indicated that both beta-carotene absorption and vitamin A liver storage may be influenced by the kind of carbohydrate fed. When the rats were fed either glucose, wheat starch, potato starch, or a wheat starch-glucose mixture as the only source of dietary carbohydrate, utilization of absorbed carotene or vitamin A was lowest in the group fed glucose and highest in the group fed the wheat starch-glucose mixture.

The Polish studies have supplied leads to some factors requiring further investigation, especially as the problem of vitamin A deficiency may apply to humans.

Such factors should include investigation of:

- other nutritional sources of the dietary ingredients tested;
- additional sources of vitamin A-active compounds;
- influence of conventional and modern technological culinary practices on availability and metabolic efficiency of different vitamin A-active compounds.

Dr. Mildred Adams, Beltsville, Md., was ARS sponsoring scientist; Dr. Stanislaw Berger was principal investigator for this project, conducted at the Warsaw Agricultural University. ■

Dry Inoculum

A BIG BARRIER has been penetrated in research on anthracnose disease in alfalfa with the development and use of new dry inoculum.

The dry inoculum can be easily prepared by plant breeders who, until now, depended on plant pathologists, microbiologists, or highly trained technicians for laboratory-prepared agar cultures.

This was inconvenient, time consuming, and costly, and may have helped hinder the development of resistant varieties, though anthracnose has been recognized as a pathogen of alfalfa for more than 60 years.

Anthracnose thins stands, reduces yields, lowers overwintering capability, and causes root rot. Reduced or complete lack of alfalfa recovery in the spring often has been erroneously attributed to winter injury instead of to root rot which actually started the preceding growing season.

Developer of the new method, Dr. Stanley A. Ostazeski, ARS plant path-



Dr. Ostazeski checks the moisture level of drying alfalfa. It will be ground to make anthracnose inoculum when its moisture content reaches 12 percent at 40° C. (370A 136-2).



Technician James E. McMurtrey III harvesting seed to propagate alfalfa for these studies (370A138-18).

Expedites Disease Research

ologist at Beltsville, Md., calls it "a technique born of need." It came about after anthracnose was observed in field plots at Clarksville, Md., where alfalfa weevil studies were being conducted cooperatively with the Maryland Agricultural Experiment Station. Investigations by Dr. Donald K. Barnes and Dr. Clarence H. Hanson, ARS plant breeders, determined that resistance levels in those alfalfa populations made it feasible to develop anthracnose-resistant varieties.

To go ahead, however, they needed a steady source of inoculum. Dr. Ostazeski, then pursuing another research problem, agreed to temporarily supply the conventional inoculum. Since more inoculum was needed than was originally anticipated, he sought an alternate source in anthracnose-killed plants from a previous test cycle. Dr. Ostazeski ground the plants and applied the powdered material to the test alfalfa plants. In subsequent tests the dry inoculum proved as effective

as the conventional agar cultures.

All that is needed to use Dr. Ostazeski's technique is a "starter," either of agar cultures or of a little dry inoculum, to inoculate plants. From then on, the anthracnose-infected plants become the inoculum for succeeding inoculations. The killed plants are dried, ground in a laboratory mill to a coarse powder, then simply dusted on moistened test plants.

The dry inoculum is not only easily and quickly prepared but it stores well. In contrast, that made from agar cultures ages rapidly and loses its virulence and viability in about 2 to 3 weeks. So far, frozen dry inoculum, has remained viable for over 10 months and perhaps will do so indefinitely.

The new technique now enables plant breeders to look beyond the agronomic aspects of alfalfa breeding; they can also concurrently work independently toward developing anthracnose-resistant varieties.

Since the pathogen also attacks red clover, Dr. Ostazeski says both the technique and inoculum can aid in screening this species for anthracnose resistance. He adds that the technique has potential for studies of other foliar pathogens in other grass and legume forage crop species.

In their continuing research on multiple pest resistance at Beltsville, Dr. Hanson and Dr. Thomas E. Devine, ARS geneticist, are using the dry inoculum technique exclusively and are well on their way to developing anthracnose resistance in a broad array of alfalfa varieties and populations. The effectiveness and low cost of the dry inoculum technique makes feasible the development of anthracnose resistance in all varieties which are to be grown where this disease is a problem. In two populations, high anthracnose resistance has been successfully combined with resistance to bacterial wilt, common leaf spot, rust, and potato leafhoppers. ■



Anthracnose-infected alfalfa, first properly dried, is fed into grinder to make a batch of dry inoculum. It will be as effective as conventional agar cultures (370A139-6).



*Dr. Ostazeski dusts stems of birdsfoot trefoil with *Stemphylium loti* to demonstrate use of dry inoculum technique on species other than alfalfa (370A139-12).*



Airborne Ammonia Eutrophies Lakes

AIRBORNE AMMONIA from cattle feedlots near lakes and rivers may contribute more nitrogen enrichment to those bodies than runoff and deep percolation from the same sources.

The bodies of water simply absorb ammonia, a nitrogen compound, from the air. In one lake in northeastern Colorado a little over a mile from a

large feedlot, the surface absorbed about 30 pounds of nitrogen as ammonia per acre per year.

The discovery upsets the prevailing concept that the problem of pollution from cattle feedlots will be solved when a way is found to dispose of animal wastes safely, unless that disposal includes provisions for control-

ling volatilization of ammonia. As much as 90 percent of the urinary nitrogen excreted on a feedyard can be released as ammonia directly into the air.

Growth of algae in a lake is dependent on 15 or 16 different factors—temperature, light, carbon dioxide, and many mineral nutrients—being in adequate supply. In many lakes, the supply of nitrogen and phosphorus appears to be limiting. About 0.01 part per million of phosphorus and 0.5 ppm of nitrogen must be present in the water for algal growth. Hence, Gordon L. Hutchinson and Frank G. Viets, Jr., ARS soil scientists at Fort Collins, Colo., report that “30 pounds of nitrogen per acre is sufficient to eutrophy (enrich) a lake averaging 20 feet in depth to two or three times the concentration needed for algal blooms.”

Lakes in the vicinity of smaller feedlots (800 head) absorbed as little as 13 pounds of nitrogen per acre per year. That is still four times the amount that was measured at a pond

This ammonia trap, located near a feedlot, contains dilute sulfuric acid and water. The acid increases the water's ability to retain ammonia and minimizes its biological transformation (PN-1890).



located at least 10 miles from any feedlot.

The objective of the research was to determine the rate at which ammonia is absorbed directly from the air by water surfaces under different conditions of temperature and climate at various distances and directions from feedlots. At the same time, scientists measured the amount of ammonia contributed by rain and snow.

The researchers found that ammonia volatilizes from feedyards and is absorbed by lakes throughout the year—even when both are covered with ice and snow.

Wide fluctuations in weekly absorption rates noted at the testing sites were probably due to the moisture status of the feedlots. Absorption peaks coincided with times when the feedlots were undergoing rapid drying, and low points paralleled periods of precipitation or low evaporation.

Indications are that even small feedlots may release enough ammonia to have an effect on nearby water surfaces. At one of the testing sites, am-

monia absorption rates were low until several local small operators began using the feedlots that had been idle during the summer months. Ammonia absorption rates climbed when feeding operations resumed.

Specially constructed ammonia traps and rain gages were installed at each of five sites near feedlots and in two control areas. The amount of ammonia collected by the traps was measured at weekly intervals from late July through late February. Ammonia analysis was done by steam distillation with magnesium oxide.

The traps, with a water surface area of about 26 square inches, contained dilute sulfuric acid. The acid increased the water's ammonia-retention capacity and minimized biological transformation of the ammonia. Dilute acid absorbs ammonia at about twice the rate of demineralized water.

To duplicate actual lake conditions, Mr. Hutchinson and Dr. Viets also floated larger ammonia traps (about 45 inches in diameter) filled with tap water and completely open to the at-

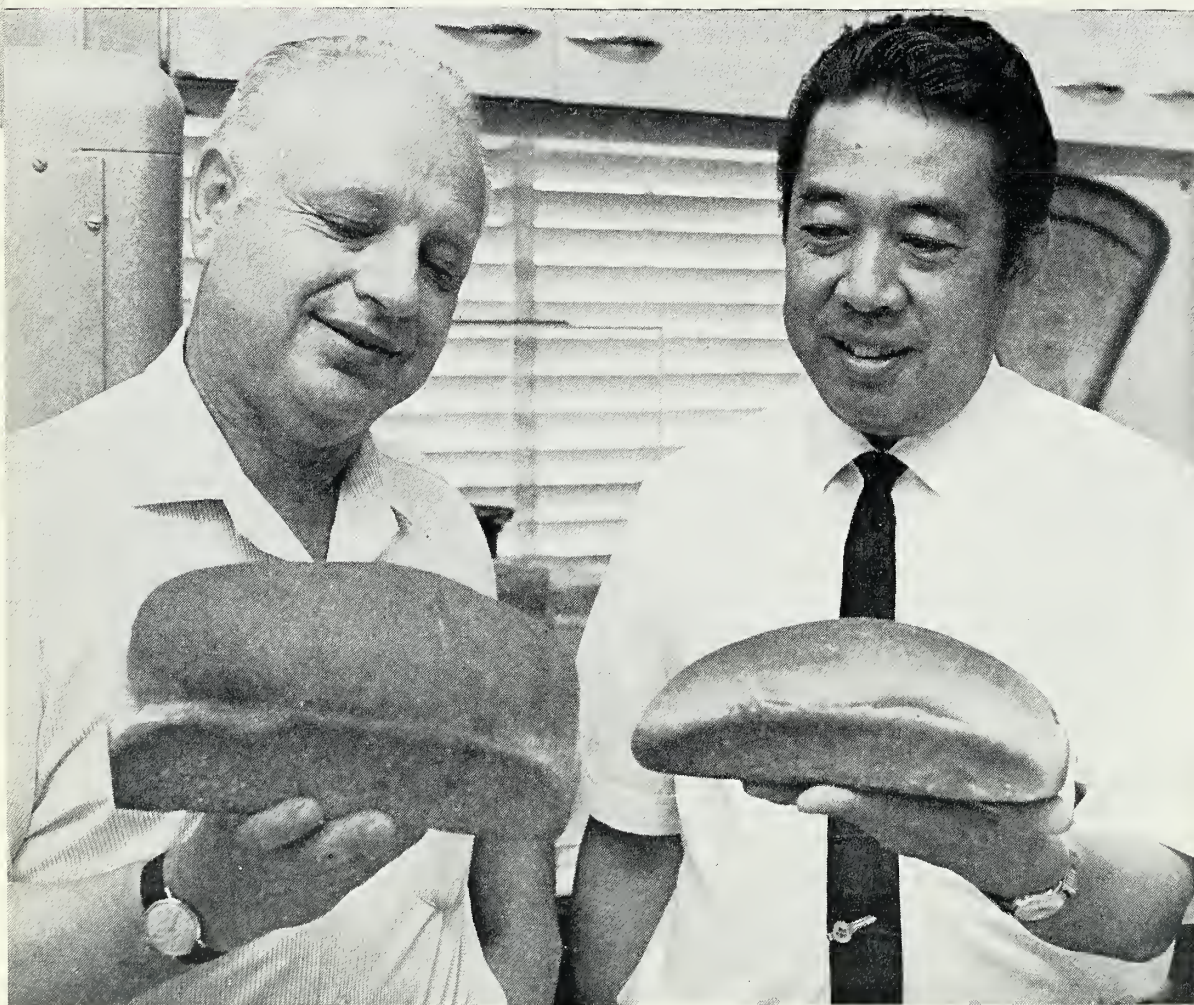


Technician collects sample of ammonia retained by trap anchored near the center of a lake. This location and use of a large trap completely open to the atmosphere helps duplicate actual conditions at the lake (PN-1889).

mosphere in the center of two lakes. Readings were similar to those from the smaller traps.

The study was made in cooperation with the Colorado Agricultural Experiment Station. ■

A Comeback for Convenience Bread?



Dr. Kline and Mr. Sugihara note greater volume of bread made from improved frozen dough as compared with that made from old type frozen dough. Both doughs were stored for 4 months at 0° F. (1954-69).

HOUSEWIVES like the idea of “convenience” homemade bread.

The idea is to buy a “loaf” of frozen dough, thaw and bake it at home, then treat the family to homemade bread in a house filled with that incomparable aroma. All with practically no work.

Sales were brisk when such a product appeared on the market about 8 years ago, but declined rapidly when many housewives were disappointed that the bread lacked the aroma, flavor volume, and texture they expected. Moreover, the dough often took too long to rise after thawing, if it rose at all.

To ARS scientists responsible for developing new or improved uses for cereals and cereal products, the situation posed a question: Can something be done to help bakers put a better product on the market? Research to find out was undertaken at the Western utilization research laboratory, Albany, Calif., by microbiologists Leo Kline and Takashi F. Sugihara, with the technical assistance of Linda M. McCready.

Loss of yeast activity during extended frozen storage is the chief barrier to making good frozen dough. The yeast must be active for the dough to rise sufficiently high and rapidly after thawing. Unfortunately, keeping yeast alive and active during frozen storage conflicts with fermentation before freezing, a highly desirable procedure. Fermentation imparts the good qualities associated with fresh-baked bread.

Bakers have found, however, that even short-time fermentation causes yeast to lose stability during frozen storage; particularly during extended storage times of 2 to 4 months.

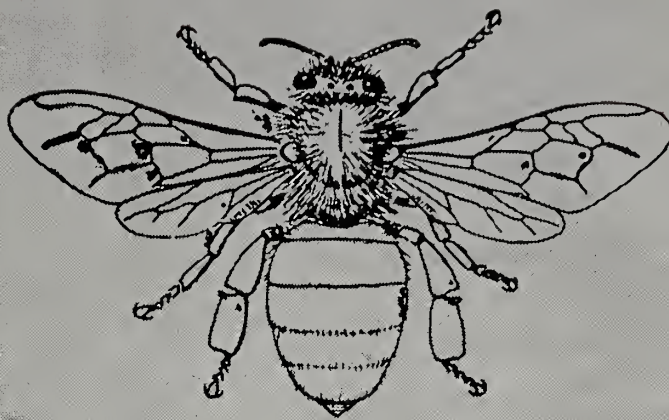
Dr. Kline and Mr. Sugihara sought to develop procedures for making improved frozen dough with two of the basic methods used in commercial

bakeries: the straight dough method and the sponge and dough method. The prime difference between the two methods is that in making straight dough, all ingredients including yeast are mixed at the start and fermentation takes place in the entire dough batch, whereas in the sponge and dough method most of the yeast fermentation takes place in only a portion of the dough (sponge) before it is mixed with the remainder of the ingredients.

Quality of bread made by the straight dough method was improved by a combination of measures including "aging" the compressed yeast for 5-7 weeks at 35° F. before use. More yeast was used than in conventional methods, and fermentation time was abbreviated and carefully adjusted according to the frozen storage shelf-life required. Some compressed yeasts were found to be better than others for use in frozen doughs. Compressed yeasts generally maintained better stability during frozen storage than did active dried yeast.

Modification of the sponge and dough method was particularly fruitful. It permitted a combination of substantial fermentation time and good yeast stability in frozen doughs, which yielded bread of excellent volume after extended frozen storage. The principal modifications involved chilling the sponge after a substantial but reduced sponge fermentation time, adding extra yeast at the second mixing stage (when the sponge and dough were combined), and accelerating the handling of dough from this point to the freezer.

Rather than single out and recommend any specific modifications, Dr. Kline and Mr. Sugihara suggest that bakers review the results of the studies, and decide which modifications or combinations would best lend themselves to individual situations. ■



Safeguarding the Honey Bee

HONEY BEES are important to agriculture—over \$1 billion worth of crops yearly depend on bees for pollination, and honey and beeswax are valued at some \$45 million annually.

Pesticides are also important in crop production, but several of them are lethal to bees. Some of these—aldrin, carbaryl parathion, and lindane, for example—have already been identified. Other commonly used pesticides are not harmful to bees. ARS is now conducting tests to check out the pesticides we are not certain of, particularly the herbicides.

In cooperative studies with the Arizona Agricultural Experiment Station, Tucson, plant physiologist Howard L. Morton and entomologists Joseph O. Moffett, and Robert H. Macdonald, all of ARS, tested the toxicity of 15 herbicides on honey bees under controlled laboratory conditions.

They fed herbicides at concentrations of 0, 10, 100, and 1,000 parts per million (ppm) in a 60-percent solution of sucrose syrup to newly emerged honey bees. These levels are much higher than

normally used to control weed pests in crops. The results were:

Non-toxic at all concentrations: Silvex, dicamba, 2,4-D, picloram, 2,4,5-T, amiben, 2-chloroethane-phosphonic acid, and 2,3,6-TBA.

Extremely toxic at 100 and 1,000 ppm: Paraquat, MAA, MSMA, DSMA, hexafluorate, cacodylic acid, and endothall.

Moderately toxic at 10 ppm: Paraquat, MAA, MSMA, DSMA, and hexafluorate.

Amine salts of 2,4-D and 2,4,5-T, ester of 2,4,5-T, and potassium salt of picloram applied in water did not increase bee mortality. But an ester of 2,4,5-T and an ester of silvex applied in a diesel oil carrier caused high mortality on the first day after treatment. All bees sprayed with paraquat, cacodylic acid, and MSMA in water died within 12 days.

While the results of the experiments are encouraging, further studies, including field tests, are needed to determine whether the herbicides that proved toxic to honey bees in these experiments are hazardous at rates required for weed control. ■



Mr. Eshbaugh and Dr. Santamour prepare to press leaves. In 1953, Mr. Eshbaugh initially screened the elm seedlings involved in this research project (0670-507-11).

Dr. Santamour examines sample of a leaf that was taken from the hybrid elm growing at the National Arboretum, Washington, D.C. (0670-507-14).



Hybrid Elm

THOUSANDS OF ATTEMPTS to cross the American elm with the Siberian elm have met with failure, despite the expertise of science and the claims of some commercial nurseries. It now appears that nature has come to the rescue.

Such a cross might produce a tree with the Siberian elm's resistance to Dutch elm disease and the American elm's longevity.

The story begins back in the early 1950's in Manhattan, Kans., when USDA's Soil Conservation Service was growing thousands of American elm seedlings for planting in farm shelterbelts for windbreaks. The seed for the program was literally swept up from the city streets where the American elm and other species were growing as ornamentals. Resulting seedlings were carefully screened by then SCS horticulturist Fred P. Eshbaugh. He selected plants that differed from typical American elms in structural characteristics and growth rates. These atypical seedlings were placed in a separate nursery area for further observation.

Shortly after Mr. Eshbaugh joined the U.S. National Arboretum where he is now assistant to the director, he arranged for a transfer of some of these plants. In March 1954, 99 1-year-old seedlings arrived of which 61 became permanent residents.

This year, as part of the Arboretum's evaluation of shade and ornamental trees, ARS geneticist Frank S. Santamour, Jr., carefully selected

those resembling the American elm in flower bud shape for cytological studies. The studies revealed one tree with a chromosome count of 42. Since the usual number of chromosomes in American elms is 56 and the number in Siberian elms is 28, the evidence strongly suggests that the 42-chromosome elm is a cross between the two.

Now 15 years old, the hybrid tree stands 34 feet tall—only a foot or two shorter than the best representatives of the group. However, it lacks the typical ascending branching pattern that imparts much of the aesthetic appeal and the abundance of shade characteristic of the American elm. Instead, the hybrid's rather short branches protrude at nearly right angles from the trunk and are irregularly spaced. From a strictly ornamental viewpoint, the tree has limited merit.

The hybrid's leaves are intermediate in size between its supposed parents, but no smaller than those of some varieties of American elms. Although its flowers resemble the American elm's, they open later in the spring.

Biochemically, Dr. Santamour found the hybrid's leaves to contain a flavonol substance, present in no elms other than the Siberian, in the Midwestern area in which the seed was collected. This, of course, lends further support to the theory of the hybrid nature of the tree.

Although the hybrid elm has not yet been tested for resistance to Dutch elm disease, rooted cuttings will be inoculated when they are 3 years old. If the tree should prove resistant, it will be used as breeding material in an attempt to combine its resistance with the outstanding growth pattern of the American elm. So here, in the possibility of genetic resistance, lies the hope of rebuilding the American elm. ■

Baling Speeds Cotton Harvest

BALING FIELD COTTON for temporary storage before ginning may relieve some of the logistical pressures brought on by telescoping the cotton harvest through mechanization.

It's been known for some time that seed cotton can be baled and stored up to a month at 10-percent moisture without much damage to the cotton. Now research by ARS agricultural engineers Alan D. Brashears, Ivan W. Kirk, and Elmer B. Hudspeth, Jr., at Lubbock, Tex., has determined how much pressure bales can withstand without impairing seed germination.

Since mechanization, cotton farmers on the Texas high plains usually wait until the first killing frost to begin harvesting so that most of the foliage will drop before the stripper-harvesters make their passes. That means that just about everyone is harvesting at once.

This condensing of the season poses problems for the farmer because often he must stop harvesting while waiting for the return of his trailers from a cotton-glutted gin. Baling—either on the farm or at the gin—could free the trailers and thus relieve this bottleneck.

In the Lubbock tests, the engineers found that seed cotton, bur cotton, and clean seed cotton can be compressed to 20 pounds per

cubic foot without significantly damaging the seed. They also found that lower-moisture seed cracked easier than high-moisture seed, that cotton requires more pressure to compress at lower moisture levels, and that bur cotton and extracted cotton are harder to compress than clean cotton.

The effect of pressure on seed quality was determined by the number of cracked seed and with germination tests. No significant difference was noted between bur cotton, extracted cotton, and clean seed cotton; however, extracted cotton did tend to have a higher percentage of cracked seed. ■

PHILIP HANDLER to present ATWATER LECTURE



Dr. Philip Handler (570-487-14).

PHILIP HANDLER, President of the National Academy of Sciences, has been named to this year's Atwater Lectureship, the third in a series initiated and sponsored by ARS.

Dr. Handler will deliver his lecture, "Can Man Shape His Future?", August 11 in Washington, D.C., during the convention of the Third International Congress of Food Science and Technology. The convention has taken SOS/70—Science of Survival/1970—as its signature.

The Atwater Lecture series honors USDA's first chief of human nutrition research, Wilbur O. Atwater (1844-1907). A forward-looking pioneer in nutrition research, Atwater was also the first director of the first State-supported agricultural experiment station (Connecticut) and the first director of the Federal Office of Experiment Stations.

Dr. Handler, elected in July 1969 as head of the Nation's most important science body, is an influential spokesman for American science. His research interests in biochemistry have included biochemical and physiological consequences of niacin and

choline deficiency, various aspects of carbohydrate and amino acid metabolism, renal mechanisms and hypertension coenzyme metabolism, structure and function of oxidative enzymes, and biochemical aspects of evolution.

Co-author of a widely used textbook, "Principles of Biochemistry," Dr. Handler recently edited a collection of essays, "Biology and the Future," released last May.

Lecturers for the Atwater series are nominated by representatives of universities, national associations of educators and of scientists, foundations, and medical societies. Speakers are chosen for their outstanding contributions to the broad field of nutrition and the sciences it embraces.

Previous Atwater Memorial Lecturers were Dr. Artturi I. Virtanen, Nobel Prize-winning Finnish chemist, and Dr. Albert Szent-Gyorgyi, Nobel Prize-winning biochemist.

Single free copies of either of the two previous lectures, titled "Some Central Nutritional Problems of the Present Time" and "Electrons, Defense, and Regulation," are available on request to this magazine. ■

FREEZING: quick way to peel tomatoes

AN EXPERIMENTAL low-temperature process for peeling tomatoes may prove commercially practical.

The process, called "cryogenic scalding," is designed to speed up the tomato peeling process for canning and reduce the amount of flesh lost during peeling. The process could result in improved product quality and reduced waste disposal. Reduced waste disposal would be a distinct advantage to canners who are constantly seeking new and better ways to

avoid polluting streams with plant effluent.

The new process was developed by ARS chemist Harold E. Brown and food technologist Thomas S. Stephens working at the Food Crops utilization research laboratory, Weslaco, Tex. It involves the use of liquid nitrogen, liquid air, or Freon 12 to freeze the skin of tomatoes within a few seconds. After the skin is frozen, the tomatoes are rapidly thawed in tap water leaving them in a loose-fitting

skin sack which can be quickly and easily removed with a minimum loss of flesh. Peeling is done by slitting the skin mechanically or by hand and allowing the fruit to slip out.

Losses during peeling are reduced to about half those incurred during the conventional hot water process. This reduction is due entirely to a smaller loss in the layers of flesh just beneath the skin. It is these color-rich layers that are essential to maintaining color grades in processed products. ■

AGRISEARCH NOTES

Latex vs. Sun Scald

Exterior white latex paint on tree trunks is the most satisfactory preventive for sunscald injury in young filbert trees.

ARS horticulturist Harry B. Lagerstedt in Corvallis, Oreg., reached this conclusion after testing 10 different reflective paints on young filbert trees. The Oregon Agricultural Experiment Station cooperated in the research.

Filbert trees, which bear filbert nuts, also called hazel nuts, produce a crop valued at over \$5 million annually in the Pacific Northwest.

When young trees are planted in orchards, they lack the protective shade that the foliage of nearby mature trees provide and are particularly susceptible to sunscald. Sunscald may kill the young trees outright, but more often it devitalizes them so that both top growth and root growth are limited.

Sunscald can severely injure tree trunks, opening the way for disease and insects. Trunk protection against the sun is important until the young tree has developed a foliage canopy to provide its own necessary shade.

The trunks of unprotected trees may be from 30 to 40° C. warmer than the surrounding air.

Exterior white latex paint at either full or half strength proved far superior than other types of trunk protection—aluminum foil, commercial tree guards, newspaper mats—in ease of application, ease of sucker control, better growth response, and lower cost.

Litter for Poultry Forages

There's enough poultry litter produced in north Georgia each year to fertilize the region's perennial forages with about 4 tons per acre per year.

And if it were possible to spread the litter on the forages, that would be just enough. Farmer experience suggests that heavier rates might be a detriment because of the potential occurrence of nitrate toxicity, grass tetany, and fat necrosis problems in grazing cows.

ARS scientists at Watkinsville, Ga.—soil scientist William E. Adams, agricultural technician Royal N. Dawson, and soil scientist Stanley R. Wilkinson—set out to find how much

broiler litter could safely be disposed on fescue and Coastal bermudagrass without damaging the stand. The Georgia Agricultural Experiment Stations cooperated.

Treatments were 0, 5, 10, and 20 tons per acre per month and 10, 20, 40, and 60 tons per acre in July only, with some of the higher rates irrigated.

Fescue was damaged by all rates of poultry litter above 5 tons per acre per month. Some weedy species in the fescue—common bermudagrass, broom sedge, dropseed, and Johnsongrass—were tolerant.

Coastal bermudagrass yields increased with rates of litter up to 20 tons per acre per month and with a one-time application of 40 tons per acre.

Coastal bermudagrass was not severely damaged in the first year by incremental rates totaling as much as 20 tons per acre, or a one-time application of 60 tons per acre applied in July without irrigation but were heavily damaged at the 60-ton rate with irrigation.

Loss of stands or yields was blamed on smothering and ammonia toxicity.



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AGRISEARCH NOTES

New Trace Element Laboratory

ARS scientists specializing in trace element nutrition research will have their own laboratory next month.

A 3-day International Symposium on Trace Elements in Nutrition, co-sponsored by ARS and the University of North Dakota and scheduled for September 15 to 17 will introduce the new facility located on the University campus at Grand Forks.

Purpose of the symposium is to focus on the several trace elements already established as essential to humans as well as others now being tested for essentiality. Elements to be discussed include chromium, fluorine, nickel, selenium, vanadium, copper, and zinc.

The new facility will be devoted mainly to research on trace minerals, a field which has assumed new urgency as evidence accumulates that deficiencies can—and sometimes do—exist in man.

The laboratory will have a nine-bed

metabolic ward, chemical laboratory, animal room. Eventually, the laboratory will be staffed with some 30 members. The laboratory will cooperate closely with the University of North Dakota Medical School and the land grant universities in the north central region.

Streams and Sediment Transport

Like a young beagle hound that carries around an old shoe or tin can in lieu of the game it was bred to retrieve, a flowing stream will “instinctively” transport silt and sediment.

When the stream doesn't pick up silt and sediment from uplands because of successful erosion-control practices, it may degrade its own channel to satisfy its sediment-carrying capacity, especially when flowing on alluvial material.

Generally overlooked is the fact that a flowing stream is dynamic and must be considered almost a living, viable entity, and a controlled environment

body and should be treated as such, says ARS hydraulic engineer August R. Robinson of the USDA Sedimentation Laboratory, Oxford, Miss.

“Unless flowing in a channel that is nonerodable, such as concrete, the stream will attempt to transport sediment up to its energy ability, and may erode or degrade the bed or surface to obtain this material,” Mr. Robinson says.

If the stream is carrying a load greater than the available energy, deposition occurs.

CAUTION: In using pesticides discussed in this publication, follow directions and heed precautions on pesticide labels. Be particularly



careful where there is danger to wildlife or possible contamination of water supplies.